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## Researchers Develop Intelligence Model

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ALBUQUERQUE — Rex Jung says researchers need to understand how the brain is put together to better understand how it unravels.

To that end, Jung — a research scientist at the Mind Research Network — and psychology professor Richard Haier of the University of California Irvine's School of Medicine scoured the neuroscience literature and analyzed studies of reasoning and measures of intelligence to put together a theoretical model aimed at letting researchers study intelligence in a more systematic way.

There's a lot of interest in measuring intelligence and how people solve tasks that require reasoning, said Jung.

"The terms intelligence and IQ are just so infused in our culture. ... We like to know fundamentally how our brains differ from others," he said.

Intelligence — the capacity of the brain to function well in a given setting — can be affected by such diseases as schizophrenia or Alzheimer's.

"Understanding how the brain produces intelligent behavior may allow us to address the cognitive decline associated with some of these devastating diseases," Jung said.

Jung and Haier, looking at the network of gray and white matter that comprises human intelligence, concluded there is significant consistency in brain structure and function related to intelligence.

From their review, they created the Parieto-Frontal Integration Theory, or P-FIT, which Jung said is the first testable, physical model of where intelligence resides in the human brain and what neural factors might affect cognitive performance.

Jung became interested in the topic prior to attending graduate school, when he started volunteering to work with Special Olympics, an international nonprofit organization dedicated to helping people with intellectual disabilities become physically fit, productive members of society through sports training and competition.

"I became attached to this group of individuals as a coach and as a friend, and I wanted to do something for that group of individuals," he said.

"It would be really nice if we could figure out ways to mitigate the damage done by neurological brain disorders that result in mental retardation. ... It would be great if we could help adults and youngsters who require a lot of help just to get through the day," Jung said.

A lot of researchers are looking for ways to cure Alzheimer's, schizophrenia or mental retardation, but not many are looking at the other side of the coin — research into what brains do well and how that can help research into what brains don't do well, Jung said.

With the P-FIT, researchers will now be able to test their studies against a model.

"Instead of having a piecemeal approach at looking at intelligence ... we now have a unified model to move forward with," said Jung, who expects the model to become more refined over time.

The neuroimaging studies they looked at analyzed both brain structure and function, including white matter and gray matter correlates of intelligence.

To explain those, Jung likens gray matter and white matter to the Internet in which computers connect to other computers so they can function at a higher rate than they could function alone. Gray matter can be compared to a computer's central processing unit, while white matter functions like the cables that allow the processing centers to communicate with each other.

Some of the 19 peer reviews published with the article faulted the limitations of the theoretical model. But Jung and Haier note that overall, those commentaries recognize P-FIT as "a reasonable empirical framework to test hypotheses about the relationship of brain structure and function with intelligence and reasoning."

"Some researchers out there ... may be able to tap into what we've done here and really improve people's lives in a dramatic fashion. That would be fantastic," Jung said.